

Account of Grants from the Donation Fund in 1873-74.

Mr. H. Willett, in aid of the Sub-Wealden Exploration Fund.	50	0	0
Dr. Carpenter, for apparatus to demonstrate his Theory of Oceanic Circulation	25	0	0
Dr. Ferrier, for continuation of his Investigations into the Functions of the Brain.	50	0	0
Dr. Dohrn, for the use of the Stazione Zoologica at Naples	100	0	0
	£225	0	0

*Report of the Kew Committee for the Year ending
October 31, 1874.*

Magnetic Work.—The Magnetograph instruments were dismantled in January 1874 for the purpose of thorough examination and readjustment, as was announced in last Report. The necessity for this measure is obvious, when it is remembered that the instruments had been in uninterrupted action for the period of fifteen years.

The scale-values were accordingly redetermined, and the instruments handed over to Mr. Adie for examination and repair. They were returned and remounted in May, but have not been set in continuous action as yet, inasmuch as it is intended that the automatic records should be suspended for the entire year, so as to commence a new series of observations with the year 1875. The cost of these operations has been £77 10s.

The monthly observations with the absolute instruments have been continued, as usual, by Mr. G. M. Whipple, who also takes charge of the general magnetic work, in which he has had the assistance, for the first part of the year of Mr. Cullum, and latterly of Mr. Power.

As regards the Magnetic Reductions, the Tabulations of Declination have been completed up to the end of 1873; and copies of the results to 1872 have been intrusted, for discussion, to the two Sergeants of the Royal Artillery, formerly in Sir E. Sabine's office at Woolwich, who have been in constant attendance at Kew since Nov. 1871. The Tabulations of Inclination and Horizontal Force have not been effected.

Magnetic data have been supplied to Dr. Wijkander, of Stockholm, in connexion with the Swedish Expedition to Spitzbergen, M. Diamilla Müller, of Florence, and Capt. Creak, R.N.

A Unifilar and Dip-circle have been repaired for use at the Observatory, and another pair of similar instruments have been lent to the Rev. S. J. Perry, F.R.S., for use at Kerguelen Island, on the Transit of Venus Expedition, as mentioned in last Report.

Meteorological Work.—The several automatic arrangements for recording respectively the Barometer, the Dry- and Wet-Bulb Thermometers, the Anemometer, and the Rain-gauge, have been maintained in constant action under the superintendence of Mr. T. W. Baker, assisted by Mr. Foster and Mr. Figg; and the daily standard eye-observations for control of the photographic records have been made regularly.

The instrumental traces with hourly tabulated values are sent monthly to the Meteorological Office as in former years. The Barograms and Thermograms are obtained in duplicate, and one copy is preserved at Kew. As regards the Anemograms and Hyetograms, the copy is obtained by the method of tracing.

In addition to the regular work of Kew as one of the self-recording Observatories in connexion with the Meteorological Office, the duty of examining and checking the work of all the seven Observatories of the same character has been carried on, in accordance with the method described in the Report of the British Association for 1869. This portion of the work has been performed by Messrs. Cullum, Hawkesworth, and Deane.

A series of investigations have been conducted with the view of testing the degree of accuracy attainable in the tabulation of the Thermograms by the process described in the British-Association Report just referred to. It has been found to be an improvement to set the glass tabulating-scale by means of fiducial lines traced on the Thermograms by photographic means, in preference to setting it, as heretofore, by standard readings. The great advantage derived from the new method is the discovery of "bagging" whenever it exists in the curves.

Electrometer.—The Self-recording Electrometer, which had been taken to Glasgow for alteration, as described in last Report, was returned by Mr. White in February, and was adjusted for action on March 10. It has since continued in satisfactory working order.

Photoheliograph.—A necessity for reexamining the measurements of the series of Kew sun-pictures having arisen, they have been retransferred to Kew by Mr. De La Rue, and their reexamination has been undertaken, at his expense, by Mr. Whipple, assisted by Mr. M'Laughlin, who has been temporarily engaged for this purpose.

The eye-observations of the sun, after the method of Hofrath Schwabe, have been made daily by Mr. Foster, when possible, as described in the Report for 1872, in order, for the present, to maintain the continuity of the Kew record of sun-spots.

Extra Observations.—The Committee, at the request of Prof. Roscoe, F.R.S., undertook to test for a year an instrument which he had devised for measuring the chemical intensity of daylight, as described in the 'Proceedings of the Royal Society,' vol. xxii. p. 158. The apparatus was completed for trial in September, but a few preliminary experiments showed that it required further adjustment; so that operations in this

direction are suspended for the present, to be resumed as soon as the instrument is in a satisfactory condition.

The daily record of temperature from Thermometers at different elevations on the Pagoda in the Royal Gardens, Kew, at the expense of the Meteorological Committee, was continued up to August, when it was interrupted, to be resumed during the winter months.

Verifications.—This department of the Observatory has exhibited increased activity, especially as regards the verification of Thermometers and the construction of Standard Thermometers.

The following magnetic instruments have been verified :—

Constants have been determined for

- A Unifilar for Prof. J. Clerk Maxwell, F.R.S.
- „ „ Prof. Balfour Stewart, F.R.S.
- „ „ Rev. S. J. Perry, F.R.S.
- „ „ Mr. P. Adie.
- A Magnet „ Lisbon Observatory.
- „ „ Prof. Buys Ballot, Utrecht.
- „ „ Prof. Smirnow, Kasan.
- 3 Magnets „ Kew-Observatory stock.

The following instruments have been verified :—

- 2 Dip-circles for Mr. Casella.
- 1 Dip-circle „ Prof. Wild, St. Petersburg.
- 1 „ „ The Imperial Admiralty, Berlin.
- 2 Fox's Circles „ „ „ „
- 2 Needles „ Prof. Smirnow.
- 2 „ „ Dr. E. van Rijkevorsel.
- 1 „ „ H.M.S. 'Challenger.'
- 3 Azimuth Compasses for the Royal Geographical Society.

The complete set of Magnetographs for the Rev. A. M. Colombel, S. J. for Zi-ka-wei, near Shanghai, have been verified and forwarded to their destination.

A set of similar instruments has been ordered by Capt. Pujazon for the Marine Observatory of San Fernando, near Cadiz.

The part of this work which relates to Meteorology is entrusted to Mr. Baker. The meteorological instruments which have been verified are as follows :—

Barometers, Standards	110
„ Marine and Station	40
	150
Aneroids	10

Thermometers, ordinary Meteorological	1471
„ Boiling-point Standards	22
„ Mountain	32
„ Clinical	1255
	2780

In addition, thirty-six Thermometers have been tested at the freezing-point of mercury, and one metallic Thermometer has been tested.

Eighteen Kew Standard Thermometers have been calibrated and divided at Kew.

The following miscellaneous instruments have also been verified :—

Rain-gauges	13
Robinson's Dial Anemometers	14
Telescope	1
Sextant	1
Theodolite	1
Hydrometers	66

A Barograph and Thermograph have been verified for Mr. Kingston for the Observatory at Toronto, and the values of the Scales have been determined as far as practicable.

Experiments have been made with a view to the construction of an apparatus devised by Mr. F. Galton, F.R.S., for facilitating the verification of thermometers, and also for rendering it possible to extend the range to which the Kew verifications at present apply.

A large stock of filled Thermometer-tubes for the construction of Standards has been laid in, and the tubes have been annealed.

In the last Report mention was made of certain experiments in progress with respect to the testing of Anemometers, a piece of ground having been rented in the Park for erecting the instruments.

The experience of a few months was sufficient to show that the exposure in the Park was not nearly sufficiently open to afford facilities for testing the instruments at any but very low velocities, and not very satisfactorily even in such cases. Application was therefore made to the Secretary of the Crystal Palace Company for permission to employ a rotary machine driven by steam-power, so as to be able to vary the velocities at pleasure.

Consent having been most freely given, the experiments were commenced, and the instruments tested at various velocities up to about 30 miles an hour, the highest attainable by the apparatus. The investigations were interrupted during the summer, and will be resumed on a future occasion. It is hoped that by this method of artificial rotation, which was that employed by Smeaton in his experiments on windmill sails, more satisfactory results will be attained than it is otherwise possible to

get. The expense of these experiments has been defrayed by a vote of the Government-Grant Fund.

The experiments on the vibration of pendulums, which were conducted by Capt. Heaviside, R.E., in connexion with the Great Trigonometrical Survey of India, as mentioned in the last Report, were completed at the end of May. The apparatus employed in the experiments, with the exception of the Russian pendulums and their accessories, was, at the request of Prof. G. G. Stokes, F.R.S., received at Kew for storage.

The apparatus for testing Sextants, which had been temporarily removed in 1873 to afford space for swinging the Russian pendulums, has now been restored. The entire cost of this restoration and all other expenses connected with these pendulum experiments have been defrayed by the India Office.

The collimators of the Sextant Testing-apparatus have been arranged so as to be illuminated by gas-jets.

Waxed paper for photographic purposes has been supplied to the Meteorological Office (3 reams), the India Office (1 ream), the Magnetic Observatory, Toronto (4 reams), the Central Observatory, St. Petersburg (1 ream), the Hohe Warte, Vienna ($\frac{1}{2}$ ream), the Observatory of Don Luiz, Lisbon ($\frac{1}{2}$ ream).

It has been found necessary to make a change in the arrangements for obtaining waxed paper. For many years, through the kindness of a firm, the paper waxed at Kew has been hot-pressed at a nominal charge, but it was not found possible to continue this arrangement for an indefinite period. Waxed paper has now to be purchased, ready-made, at a considerable increase of cost, and the rate at which it is supplied to observatories has been consequently proportionately increased.

Mr. McClatchie and Mr. Beazeley, gentlemen holding appointments in the Chinese Customs Departments, and Mr. Steventon, appointed Assistant to the Observatory at Mauritius, have received instruction in the manipulation and methods of testing both Meteorological and Magnetic instruments, and the management of the photography of the self-recording apparatus.

In the month of September the Superintendent was informed by the President of the Royal Society that that body was prepared to remove the instruments belonging to it, which had been deposited at Kew for storage in Sept. 1851. Accordingly, on the 25th of September, they were handed over to Mr. Ladd, Optician, who had been commissioned by the Council to receive them.

The several pieces of Mechanical Apparatus, such as the Whitworth Lathe and Planing Machine, procured by Grants from either the Government-Grant Fund or the Donation-Fund, for the use of the Kew Observatory, have been kept in thorough order; and many of them are in constant and the others in occasional use at the Observatory.

Library.—In addition to the usual Donations of English and Foreign

Scientific Books, a most valuable present, consisting of twenty-four volumes, chiefly astronomical, has been received from the Athenæum Club.

Staff.—The Staff employed at Kew are as follows;—Mr. Samuel Jeffrey, Superintendent; G. M. Whipple, B.Sc., First Assistant; T. W. Baker, Second Assistant; J. E. Cullum, J. W. Hawkesworth, J. Foster, F. Figg, A. B. Deane, C. Power, and E. Constable.

Note.—In May Mr. Rigby, whose name appeared in the Report for 1873, resigned, and Mr. Power was appointed to fill the vacancy caused by the promotion of some of the Junior Assistants.

Mr. Robert H. Scott, F.R.S., continues to act as Honorary Secretary to the Committee.

Visitors.—The Observatory has been honoured during the year by the presence of several scientific men of distinction. Among these may be mentioned :—

M. A. d'Abbadie.
Mr. J. Allan Broun, F.R.S.
Mr. H. F. Blanford.
M. Marié Davy.
Prof. Buys Ballot.
M. W. de Fonvielle.
M. W. H. v. Freeden.
Capt. Hoffmeyer.
M. Le Verrier.
Dr. R. J. Mann, F.R.A.S.
M. H. Mohn.

Prof. A. Moritz.
Dr. H. A. Meyer.
M. Robert Müller.
Senor Jose Montojo.
Capt. Montojo.
Dr. Neumayer.
Capt. Pujazon.
Capt. Rikatcheff.
M. J. v. Rysselberghe.
Capt. Stempel.
Prof. Wiedemann.

